plates in the present volume are original ones from the skilful pencil of Mr. J. H. Emerton; these suffer in some measure (as do also some of the others) from their production by the Albert-type process; but in point of accurate detail and artistic finish their figures are immeasurably in advance of those engraved from Hentz's drawings. It is to Mr. Emerton, who appears to have resolutely entered upon the field of araneology, and to his great powers of delineation, that the arachnologists of the Old World now look for the thorough working out and illustration of the Spiders of North America.

O. P. C.

DYEING AND CALICO PRINTING

Dyeing and Calico Printing, including an Account of the Most Recent Improvements in the Manufacture and Use of Aniline Colours. By the late Dr. F. Crace-Calvert, F.R.S., F.C.S. Edited by John Stenhouse, LL.D., F.R.S., &c., and Charles Edward Groves, F.C.S. (Manchester: Palmer and Howe; London: Simpkin, Marshall, and Co., 1876.)

THE subjects treated of in the volume now before us possess a twofold interest—first as involving questions of pure science in the domain of organic chemistry; and secondly, as being of immense industrial importance to the country. It does not enter into our province to notice the work in its industrial aspect, but we have no hesitation in stating that author and editors have performed their task in a highly creditable manner. From every point of view the work will be found useful, and we can recommend it to the scientific chemist as well as to dyers and calico printers.

The author, who died in 1873, had been occupied up to the time of his death in preparing a treatise on colouring matters other than aniline. The present work has been edited from the author's MSS. with the addition of five chapters, forming a considerable portion of the book, on the coal-tar colours, by the editors.

The mode of treatment pursued is nearly the same for each dye. The natural history and source of the material from which the colour is obtained are first given, then the chemical composition and mode of preparation or manufacture, and finally the method of application to the various fabrics described. The whole subject is profusely illustrated by specimens of dyed and printed fabrics pasted into the book.

The work is appropriately prefaced by an obituary notice of the author. The first chapter treats of colour in general and the action of different forces, chemical agents, &c., on the various colouring matters. We must object to the definition of colour given in this chapter. It is defined as "the impression that the light reflected from a surface makes upon the eye," thus excluding all cases in which colour is caused by *absorption*.

Chapters II. and III. are entirely devoted to madder dyes, and contain, among much valuable chemical information, a description of Prof. Stokes's optical tests for alizarin and purpurin. The method of dyeing in Turkey red and the action of different mordants in madder and garancin printing is clearly explained, and the manufacture of artificial alizarin described. Chapter IV. treats of the red dyewoods—logwood, sapan, Lima, peach, and Brazil woods; also of safflower and alkanet. Chapters V. and VI. are devoted to indigo—this portion of the subject being described in considerable detail. Chapter VII. contains accounts of cochineal, kermes, gumlac, lac dye, lac lake, and murexide, while Chapter VIII. treats of orchil, cudbear, and litmus. In Chapter IX. some of the important yellow colouring matters are treated of, such as quercitron, fustic, Persian berries, weld, aloes, turmeric, annatto, &c.; while tannin matters form the subject of Chapter X., the most important of these being sumach and catechu. Chapter XI. contains descriptions of the methods employed for testing and determining the commercial value of particular samples of the various dyestuffs. In this chapter will be found described some of the different forms of "colorometers" which have been devised for estimating the colouring power of dyes.

The portion of the work devoted to the coal-tar colours commencing with Chapter XII. begins with an account of the various bodies which have been found in coal-tar. A list of thirty-eight distinct compounds is given, and many more doubtless exist. The most important substance produced in the dry distillation of coal, so far as the dye manufacturer is concerned, is benzene. The conversion of this substance into aniline is explained, and the manufacture of magenta described, the chapter concluding with an account of safranine and some other aniline reds. Chapter XIII. treats of aniline violets, and blues such as mauve, the Hofmann and methyl-aniline violets, diphenylamine, and Nicholson's blues, &c. In Chapter XIV. we have a description of the greens, aldehyde, iodine, and methyl-aniline and the aniline yellows, phosphine, zinaline, &c. Chapter XV. treats of aniline black and brown, and the concluding chapter is devoted to the phenol, cresol, and naphthalene colours, including picric acid, corallin, aurin, and others. Not the least useful portion of the book will be found the tables at the end, which consist, first of a list of the madder-colouring matters, their formulæ, and reactions, and then a series of tables, which will enable the analyst to distinguish the different colours when fixed on fabrics.

The above imperfect sketch of the present volume will enable our readers to form an idea of the immense number of distinct compounds used in dyeing and calico printing, and the apparently heterogeneous nature of the products, both natural and artificial, called upon to furnish materials for these arts. It must not be forgotten that the enormous development of these industrial arts within the last few years is entirely due to researches undertaken in the first instance without special regard to the commercial aspects of the questions involved—witness the accidental discovery of mauve, the first of the aniline dyes, in the course of an investigation for obtaining quinine by artificial means.

The manufacture of alizarin, the colouring principle of madder, is another triumph of organic chemistry, of which the present generation may justly be proud. It is perhaps not going too far to look for a similar achievement with regard to indigo—in point of fact we may remind our readers that the colour-giving principle of this substance has already been synthesised by the following series of reactions.

A mixture of dried calcium, acetate, and benzoate is

submitted to distillation in order to obtain the ketone known as acetophenone :—

$$Ca\begin{Bmatrix} OC_2H_3O \\ OC_2H_3O \end{Bmatrix} + Ca\begin{Bmatrix} OC_7H_5O \\ OC_7H_5O \end{Bmatrix} = 2CO\begin{Bmatrix} CH_3 \\ C_6H_5 \end{Bmatrix} + 2CaCO_3$$

Calcium acetate. Calcium benzoate. Methyl-phenyl ketone. Calcium carbonate.

Methyl-phenyl ketone when treated with fuming nitric acid yields two isomeric nitro-derivatives, $C_8H_7(NO_2)O$, one of which when heated with a reducing mixture composed of zinc dust and soda lime is converted into indigo blue :—

$$2C_8H_7(NO_2)O - 2H_2O - O_2 = C_{16}H_{10}N_2O_2$$

Nitro-acetophenone. Indigo blue.

The process above given is at present only valuable from a scientific point of view, since the yield of indigotin is but small. It yet remains to convert this laboratory reaction into a practicable process, in order to do for indigotin what has already been accomplished for alizarin, and thus completely revolutionise another large branch of the colour-producing industry.

R. MELDOLA

OUR BOOK SHELF

Scientific Culture. By Josiah P. Cooke, Jun., Professor of Chemistry and Mineralogy in Harvard College (U.S.). (London : H. S. King and Co., 1876.)

THIS is altogether an admirable address, characterised by real eloquence and by clearness and decision of view as to the place which science ought to occupy in any system of education. Most of Prof. Cooke's audience were teachers by profession, attending Harvard University mainly to become acquainted with the experimental methods of teaching physical science. We commend the address not only to scientific students and teachers of science, but to all who take an interest in education, and to all students who desire a clear statement as to what, in the not distant future, will be regarded as the only liberal education, an education in which science will be allotted a place of at least equal importance with that of literature. What Mr. Cooke's views are on certain matters which have for long been discussed in this journal, may be learned from the following extracts. On the place which Science ought to occupy in education, he says :—

"I must declare my conviction that no educated man can expect to realise his best possibilities of usefulness without a practical knowledge of the methods of experimental science. If he is to be a physician, his whole success will depend on the skill with which he can use these great tools of modern civilisation. If he is to be a lawyer, his advancement will in no small measure be determined by the acuteness with which he can criticise the manner in which the same tools have been used by his own or his opponent's clients. If he is to be a clergyman, he must take sides in the great conflict between theology and science, which is now raging in the world, and unless he wishes to play the part of the doughty knight, Don Quixote, and think he is winning great victories by knocking down the imaginary adversaries which his ignorance has set up, he must try the steel of his adversary's blade. . . . .

"I feel that any system of education is radically defective which does not comprise a sufficient training in the methods of experimental science to make the mass of our educated men familiar with this tool of modern civilisation ; so that when, hereafter, new conquests over matter are announced, and great discoveries are proclaimed, they may be able not only to understand but also to criticise the methods by which the assumed results have been reached, and thus be in a position to distinguish between the true and the false. Whether we will or not, we must live under the direction of this great power of modern society, and the only question is whether we will be its ignorant slave or its intelligent servant."

On the uses to which Universities should be put, Mr. Cooke's opinions are decided :—

"The time has passed when we can afford to limit the work of our higher institutions of learning to teaching knowledge already acquired. Henceforth the investigation of unsolved problems, and the discovery of new truth, should be one of the main objects at our universities, and no cost should be grudged which is required to maintain at them the most active minds in every branch of knowledge which the country can be stimulated to produce.

"I could urge this on the self-interest of the nation as an obvious dictate of political economy. I could say, and say truly, that the culture of science will help us to develop those latent resources of which we are so proud ; will enable us to grow two blades of grass where one grew before ; to extract a larger per cent. of metal from our ores ; to economise our coal, and in general to direct our waiting energies so that they may produce a more abundant pecuniary reward. . . . This is all true, and may be urged properly if higher considerations will not prevail. It is an argument I have used in other places, but I will not use it here ; although I gladly acknowledge the Providence which brings at last even material fruits to reward conscientious labour for the advancement of knowledge and the intellectual elevation of mankind. I would rather point to that far greater multitude who have worked in faith for the love of knowledge, and who have ennobled themselves and ennobled their nation, not because they have added to its material prosperity, but because they have made themselves and made their fellows more noble men."

These are but small samples of the many good things contained in Prof. Cooke's address, which we should like to see in the hands of all students. The latter portion of the address students of mineralogy will find of special value.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*]

On the most Northerly Latitude at which Land and Freshwater Molluscs have hitherto been found

I AM very sorry that I have involuntarily made a mistake in a letter to Mr. Oscar Dickson (NATURE, vol. xiii. p. 96), in which it is stated that Dr. Stuxberg had found a Physa on the most northerly locality from which land and freshwater molluscs have hitherto been obtained. When I made this statement I had not Middendorff's "Sibiritche Reise" with me, and I did not then remember that this celebrated naturalist had found a species of the same genus on the Taimur peninsula north of the seventy-third degree N.L. A. E. NORDENSKJÖLD

Stockholm, Jan. 29

Prof. Tyndall on Germs

HAVING commented elsewhere (*Lancet* and *Brit. Med. Journ.* Feb. 5) upon Prof. Tyndall's recent attempt to establish the truth of the Germ Theory of Disease, my remarks in your columns may be very brief.

Prof. Tyndall tells the public he has uniformly failed to obtain evidences of putrefaction in previously boiled organic infusions protected from contamination by atmospheric particles.

The following investigators have, however, with one or other fluid, been able to obtain such results :—

1. Schwann, *Isis*, 1837 ; Poggendorff's *Annalen*, 1837.
2. Mantegazza, *Giorn. dell. R. Istit. Lombard.*, t. iii., 1851.
3. Schroeder and Dusch, *Annal. de Chimie*, tome xli., 1854.
4. Schroeder, Liebig's *Annalen*, cix., 1859, and *Chem. News*, vol. v., 1862.